621.398
T38w

Thomson electric welding company

Welding ... of metals by electricity.

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CIRCULAR NO. 4.

THOMSON ∴ ELECTRIC WELDING ∴ COMPANY

WELDING, BRAZING,
FORGING, RIVETING,
SHAPING, TEMPERING,
ETC.

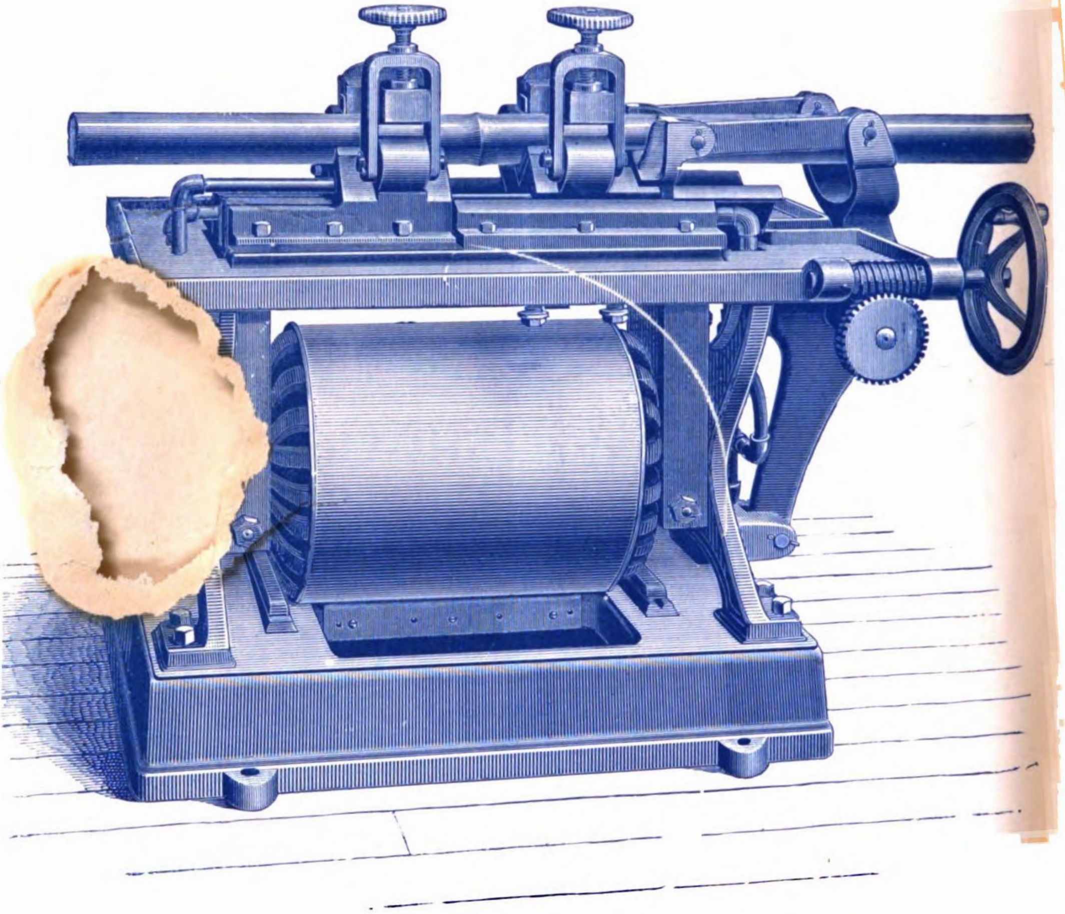
OF

METALS
BY
ELECTRICITY

GENERAL OFFICES:
FISKE BUILDING, 89 STATE ST., BOSTON, MASS.

∴

WORKS AT LYNN, MASS.



WELDER FOR STEEL OR IRON PIPE.

621.398
T38w

ELECTRIC WELDING.

THE process of electric welding and working of metals, as invented by Professor Elihu Thomson, has already been so far developed as to produce the most satisfactory results. Welding machines capable of uniting various sections of metals have been placed upon the market, giving manufacturers ample proof of their efficiency and economy, and already becoming a part of the necessary machinery required in the various industries with which they are associated. In no instance has there been a failure of a machine to do satisfactorily the work required of it, and the works of the company at Lynn are now taxed to their utmost to fill orders coming from different parts of the United States and Europe for welding apparatus for various purposes.

2 Dec 44 Ritter

THE ELECTRIC WELDING PROCESS.

FOR the information of those who may be interested in this process, the following facts are submitted:—

The principle involved in this new art is that of causing currents of electricity to pass through the abutting ends of the pieces of metal which are to be welded, thereby generating heat at the point of contact, which also becomes the point of greatest resistance, while at the same time mechanical pressure is applied to force the parts together. As the current heats the metal at the junction to the welding temperature, the pressure follows up the softening surface until a COMPLETE UNION OR WELD IS EFFECTED, and, as the heat is first developed in the interior of the parts to be welded, *the interior of the joint is as efficiently united as the visible exterior.* With such a method and apparatus, it is found possible to accomplish not only the common kinds of welding of iron and steel, but also of metals which have heretofore resisted attempts at welding, and have had to be brazed or soldered.

Pieces of such metals and alloys as wrought iron, silver, copper, brass, lead, tin, zinc, bronze, German silver, platinum, gold, aluminium, and even cast iron, are not only welded to each other, but different metals can be welded *one to another* in many combinations, extending

Gen Rev Panic 26 Jan 41 Wymser

the applications of the process to the attainment of results heretofore impossible in metal working; while the TENSILE STRENGTH OF THE WELDS, as shown by mechanical tests under the direction of the U. S. Ordnance Department, is all that can be desired.

In reference to this, Professor A. E. Dolbear, of Tufts University, writes to the American Engineering Record as follows: —

> "I have had made nearly a hundred tests of the tensile strength of electrically welded bars of iron, steel and other metals. The results were of such a character that I can state positively that with Thomson's welding process it is possible to weld both wrought iron and steel *so that the weld is as strong as the same cross-section in another part of the bar*, that the appearance of the fracture is fibrous for iron and generally granular for steel, the strength of this granular steel being on some samples as high as 125,000 pounds per square inch; that the process is such that the welding is homogeneous from necessity. I had a number of bars welded by an expert blacksmith, and a number of similar ones by the electrical process for comparison, WITH THE RESULT THAT THE ELECTRICALLY WELDED BARS WERE MUCH STRONGER THAN THOSE WELDED BY THE ORDINARY PROCESS. The bars were of various sizes, up to an inch and a half for iron and three-fourths of an inch octagon steel."

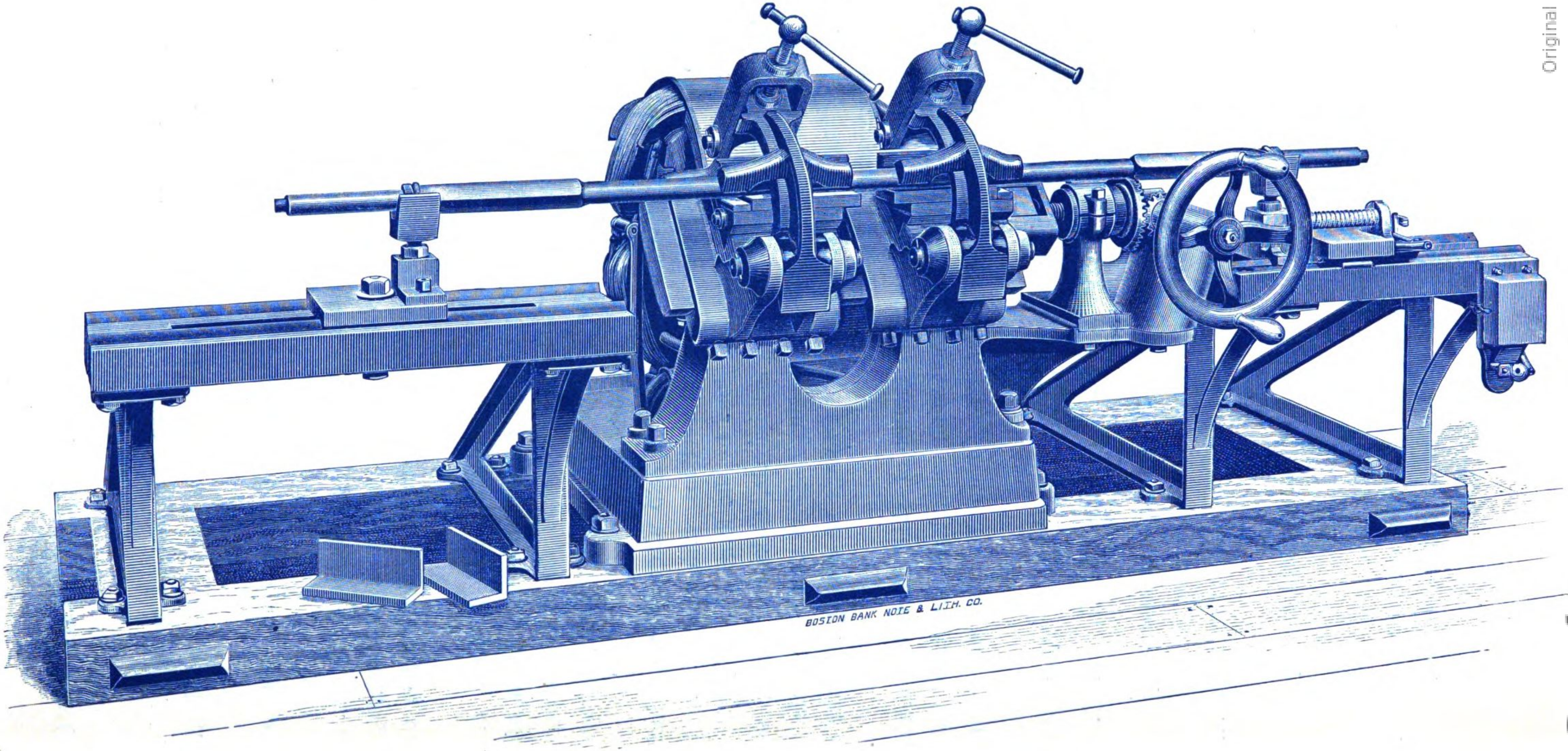
THE ELECTRIC WELDING APPARATUS.

THE machines built by the Thomson Electric Welding Company are generators of electricity, so constructed as to produce in the most economical manner the low-pressure currents essential for welding and for similar work. They are of sizes and types suited to the kind and section of the metal to be worked.

The dynamos are built to take power from any source, and the welding machines connected with them by wires to operate wherever it may be convenient to locate them.

The machines now being manufactured are so graded as to apply to various kinds of work, from the smallest wire to bars of over three inches in diameter. For heavier work, such as large forgings of locomotive frames, car axles, shafting, etc., special forms of machines adapted to the purpose will be supplied in the near future by the company, while by the use of specially adapted holders and clamps applied to the standard forms of machines, various shapes and irregular sizes of metal pieces may be united without difficulty.

The welding or working is much more economical and far superior to that produced by the ordinary methods, *while the currents used are of such low pressure as to render any danger of shocks impossible.*



WELDER FOR WAGON AND CARRIAGE AXLES.

PRACTICAL VALUE OF THE WELDING PROCESS.

THE VARIETY OF USES to which this method applies is almost endless. A brief statement, however, of a few of the applications is here given.

1. Joining of wires of copper, brass, iron, steel, aluminium or other metals.

2. Making chains of links with single or double welds, as may be desirable, both joints being formed at one operation, *and ranging from heavy ship cables to small jewellers' chains*, either of the same or different metals.

3. Joining, end to end, pipe of all kinds and of large or small diameters; welding T connections or elbows into such lines of pipe, forming non-leaking joints, and thus *invaluable for refrigerating coils, artificial ice machines, and for brewery and sugar refinery purposes*.

4. Welding safe ends to boiler tubes.

5. GENERAL WELDING IN CARRIAGE AND WAGON WORKS, including axles and tires of various sizes and sections, fifth wheels, hub bands, and miscellaneous work heretofore done by the forge.

6. Welding rings and hoops for barrels, casks and tanks; welding eye rings to the ends of bars, or making rings of precious metals.

7. Uniting steel with iron drop forgings or castings, in the manufacture of agricultural implements.

8. Welding together various grades of steel in tool manufacture, repairing tools, lengthening or shortening rods, bars, screws or bolts.

9. *Welding wire rope, cables, etc.*, for tramway and other purposes.

APPLICATIONS TO GENERAL METAL WORKING, SHAPING, FORGING, TEMPERING, ETC.

THE apparatus which is used for welding purposes may also be employed with suitable clamping devices, either now or in the near future, for ELECTRIC SOLDERING, BRAZING, SHAPING, FORGING, RIVETING, and BENDING OF METALS.

The following are a few of the results which may be thus produced: —

1. Coiling steel springs for various purposes.

2. Making twisted iron or steel for tools or other uses, and bending and twisting chains and links into desired shapes, *or making sharp joints or angles accurately situated in bars or shafts*.

3. Straightening bent shafting or bars.

4. Local annealing tempered pieces, or hardening steel or iron pieces, locally or otherwise.

5. Heating pieces to be pressed into shape while hot and in the clamps, including *moulding heads on bolts*, *upsetting shoulders or collars on shafts*, *axles*, *or spindles*.

6. Shaping bars or tubes into desired forms.

7. Brazing various parts of bicycles, gun barrels, radiators, brass fittings, *and with great economy* wherever substituted for the present brazing methods.

8. Riveting boiler plates, truss-work, ship plates, etc.

SPECIAL ADVANTAGES OF THE ELECTRIC WELDING PROCESS.

1. THE HOMOGENEOUS NATURE OF THE WELDING; as when the weld is made, the structure of the metal at the joint *is the same* as elsewhere in the parts welded.

2. ABSOLUTE CONTROL OVER THE HEAT; as, by simple appliances, the metal can be held at any temperature desired for any length of time.

3. THE WELDING PROCESS CAN BE CONTINUALLY WATCHED; as the metal while heating is visible instead of being covered with coal or hidden by flame, as in the forge process.

4. AVOIDING FLAWS,—*the union commences at the interior of the joint*, and not in an uncertain way, as in ordinary lap welding, and consequently any flaw in the process can be easily discovered and prevented.

5 RAPIDITY; as the process is almost instantaneous with small diameters, while with larger sizes it requires but a few seconds, depending upon the horse power used.

6. FLEXIBILITY OF THE PROCESS, applying as it does to various kinds and forms of metal, including those which have heretofore been united only by brazing.

7. ACCURACY, since the welds are kept in perfect line by the clamps during the operation.

8. LOCALIZATION OF HEAT AT THE WELD, and consequently no heating effect elsewhere.

9. CLEANLINESS AND AVOIDANCE OF DIRT, which is detrimental to the perfect welding of metals by the ordinary methods, and which by this process enables the work to be carried on wherever it is convenient or desirable to place the machine.

10. PREVENTION OF BLISTERING, SCALING or other injury to any portion of the metal.

11. GREAT ECONOMY BOTH IN LABOR AND TIME, AND ALSO IN MATERIAL.

12. LIGHTING OF FACTORIES OR MILLS. By using the necessary transformers, incandescent lamps can be run from the constant potential dynamos whenever the current is not required for welding purposes.

EXTRACT FROM

REPORT OF PROFESSOR CHARLES R. CROSS,

OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY,
DATED NOVEMBER 15, 1887.

"In reply to your request for my views on the subject, I will say that I am familiar with the principles and process of electric welding as invented and carried on by yourself, and have watched with much interest their utilization and development since I first became acquainted with them.

"I have from the beginning been confident that the process was susceptible of a wide practical use in various industrial processes, and all that I have learned regarding it has served to confirm me in this belief. The ability to employ the almost unlimited energy of electricity quickly to raise the temperature of the joint to be welded, delivering the heat exactly where needed, and limiting it largely to this spot; the possibility of reaching a temperature which can be attained with difficulty, if at all, by ordinary processes; the ability to graduate the amount of heat developed with so much delicacy; the dispensing with hammering and heavy pressure; the applicability of the process to almost all metals; all these *cannot fail to open a wide field for the use of the new art in every department of industry in which the metals are employed.* Meanwhile the work already done gives ample evidence of the practicability of the process."

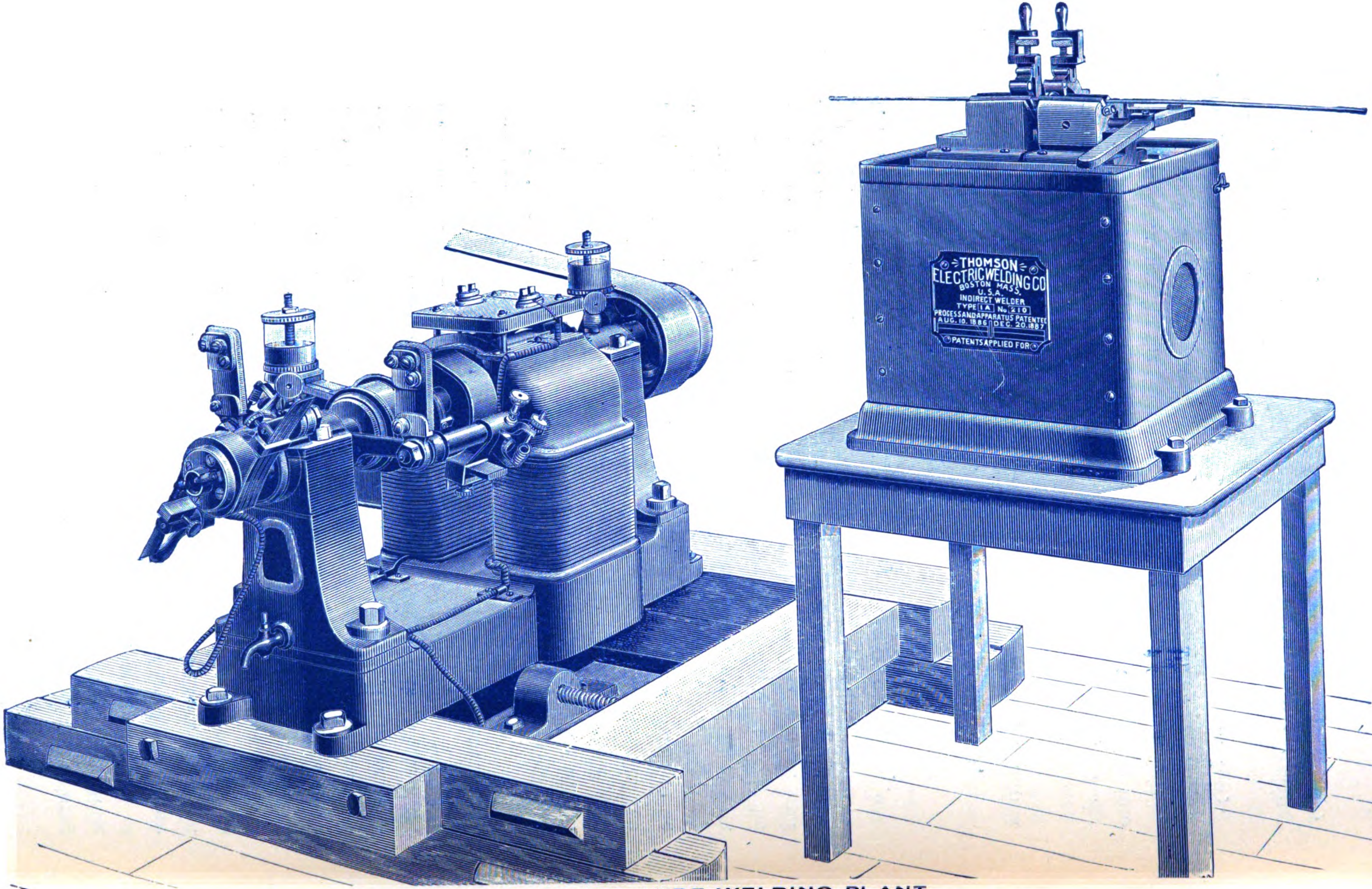
EXTRACT FROM

REPORT OF PROFESSOR A. E. DOLBEAR,

OF TUFTS UNIVERSITY.

"This method is scientifically perfect, and the mechanism to utilize it is so simple that there appears to be no likelihood of any change being made that shall much increase its efficiency or convenience. * * *

"The heat developed in the welding circuit is proportional to the square of the current strength, not proportional to the tension of the current there. The heat in such a circuit is developed chiefly at the



COMPLETE WIRE WELDING PLANT.

places where the electrical resistance is greatest, and in the welding circuit will always be at the junctions to be welded. The two abutting ends, therefore, are at once raised to incandescence, while the rest of the circuit is cool. The heat felt at the distance of an inch or two from the welded joint is the result of common heat conduction, not electrical heating. ALL THE ENERGY IS SPENT JUST WHERE IT IS NEEDED. It is one of the properties of an electrical current that it moves in the paths of least resistance, and the hotter a metal is the greater is its resistance. When, therefore, a current is sent through junctions to be thus welded, the parts of the sections which are more highly heated than the adjacent parts, force the current into the cooler parts where it is needed, until there is a uniform temperature throughout the whole area, *an important point in a welding process.*

"In this respect the electrical process is ENTIRELY AN AUTOMATIC ONE, but highly servicable. * * *

* * * "The external part of the welding circuit is so contrived as to be practically a pair of clamps into which the pieces to be welded may be fastened close to the ends to be joined, so that when these ends are in contact, an electric ring circuit is completed, consisting of the part included within the primary coils, the clamps and the metals to be welded.

"The energy spent in this circuit is most easily regulated and is thus adapted to the demands of the work to be done, whether it be with thick or thin bars or wires. *None of the energy is wasted, and there is no expenditure at all when the welding is not in progress.* Its possible range is from fine wires to massive iron and steel bars. * * * It is simply a matter of providing the necessary current of electricity."

EXTRACT FROM

REPORT OF THE U. S. NAVAL BOARD,

WHICH CONVENED AT BOSTON, MASS., FEBRUARY 10, 1890, UNDER ORDERS OF THE HON. SECRETARY OF THE NAVY.

"In obedience to an order from the Honorable Secretary of the Navy, dated January 9, 1890, constituting us a board "to examine into the process in use by the Thomson Electric Welding Co., of Boston, Mass., for welding metals, and to report as to its desirability and adaptability for naval purposes, and particularly for use on vessels of the Navy," we have the honor to make the following report:

"The process of welding in use by the Thomson Electric Welding Co., has been fully investigated by the board, both experimentally by tests made in our presence and by investigation of the theories and principles involved. * * *

"We are convinced that the Thomson Welding Process can be found of great utility to the naval service, both on shore and afloat, for the following reasons:

It can be used—

(*a*) In welding breaks in rods without altering them either in length or shape.

(*b*) For welding tubes.

(*c*) For welding angles and shapes of intricate form.

(*d*) For welding copper, brass, cast-iron or other metals.

(*e*) For heating metals for forging, tempering and upsetting.

(*f*) For welding wire cables.

"Under these heads the following may be mentioned as a few of the many applications that would result on shipboard: For welding broken pump piston-rods, valve stems, etc.; for joining wires of iron, copper or other metals or bars of the same, of similar or different shapes or sections; for making joints at angles with bars (T or V joints); for mending chain and wire rope; for constructing or joining, end to end, pipe of all kinds, and of large or small diameter; working or joining lead pipe; welding T-connections or elbows into lines of piping; welding safe ends to boiler tubes; repairing boiler tubes; welding eye-rings, and welding these again to bolts or bars; repairing cutting and boring tools without hurting their temper; lengthening or shortening rods or bars; repairing broken cast-iron pieces of machinery or broken cast-iron or cast-brass fittings; welding copper electric mains.

"*This system of welding thus renders easy many operations in the working of metals which with the forge and smith have heretofore been considered impossible.*

"It is the unanimous opinion of the Board that in the present day of ships constructed almost entirely of metals, and in which every fitting possible is made of metal, such a system as that which has been investigated by us becomes not only desirable, but a means to economy of expense, time and labor, *and would add to the efficiency of the vessel under any condition of service.*

"This system of welding occupies a position of its own; it is able to do not only a large part of the work of the forge now in use, but is capable of doing much work that was hitherto considered impossible. By its use, the large accumulation of now almost worthless boiler tubes stored at the navy yards could be made fit for service; and the quantity of spare tubes and of many other stores now carried by ships could be reduced."

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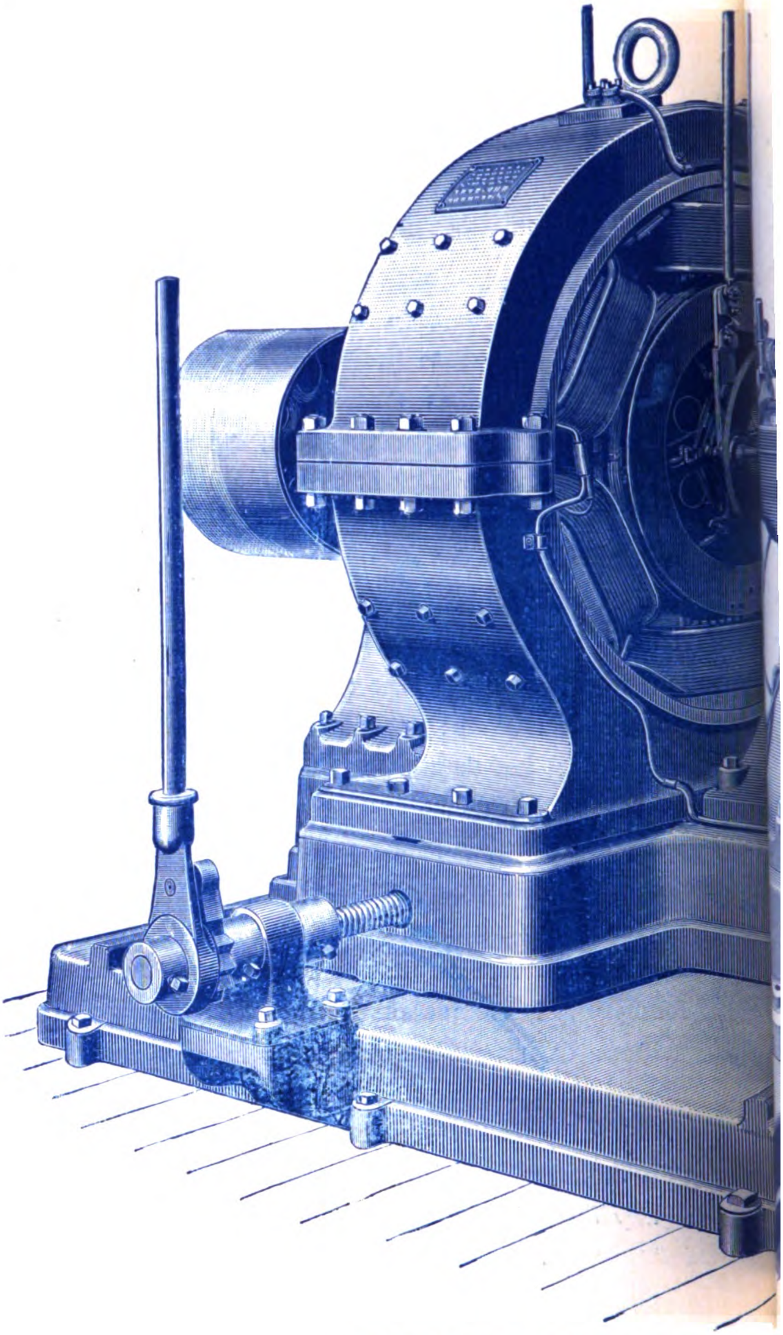

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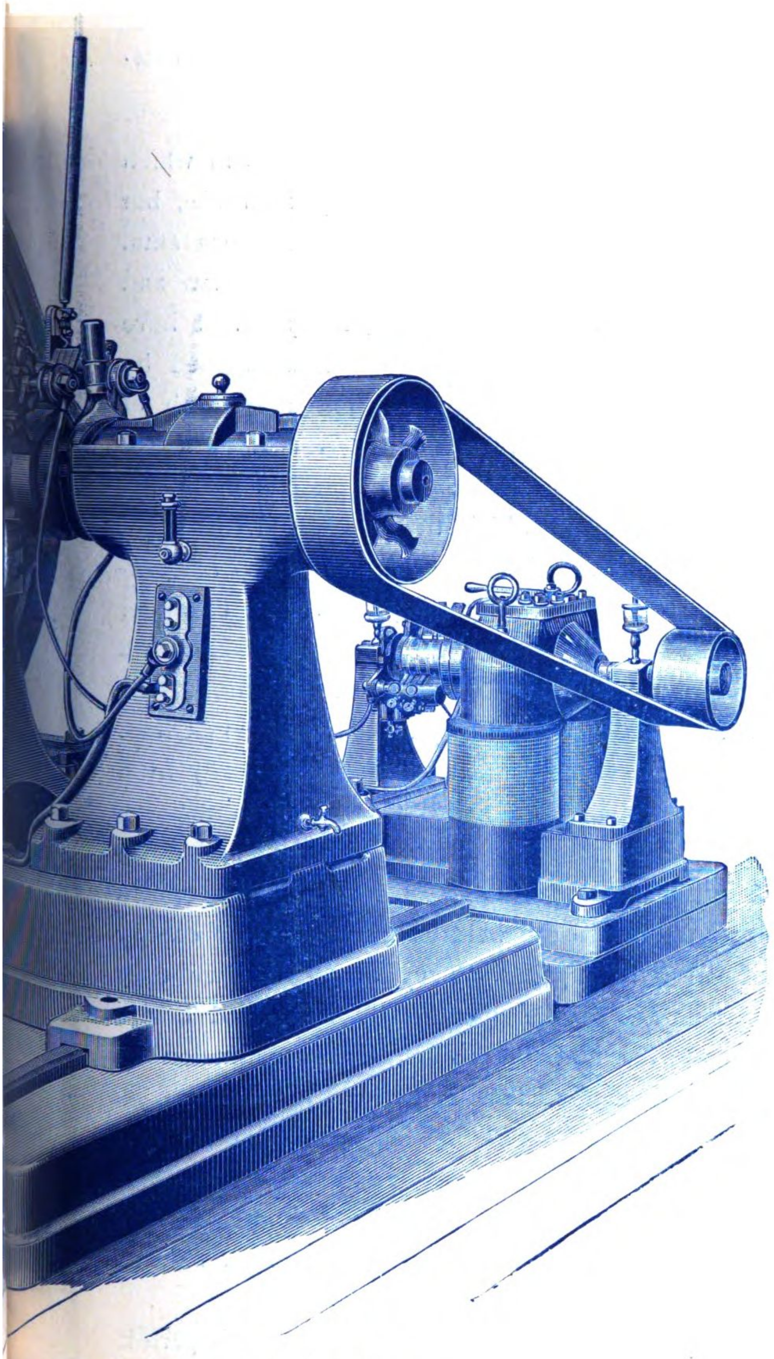


-60,000 WATTS CAPACITY.

Extract from

REPORT OF SILVANUS P. THOMPSON,

B. A., D. Sc., F. R. A. S.

Professor of Experimental Physics in University College, Bristol, Eng.

Dated February 21, 1890.

* * * "I have examined not only the welding machines in which the operation is conducted and the specimens welded by their use, but also the electric machinery for generating or supplying the electric currents. Every facility has been granted to me for observing the construction and action of the whole of the machinery and for handling it myself. I have made a number of electrical measurements upon the currents supplied by the generators to the welding machines during the execution both of large and of small welds, and in particular made a series of electrical measurements upon the eighty specimen welds executed at Hoxton in the presence of Sir Frederick Bramwell, at which trial I also was present.

* * * "*One of the most striking features of the process is the precision with which the heat is localized at the spot required.* For example, when two bars of inch iron or steel are welded, they become red-hot for a length of about 1½ inches on either side of the weld, but at distances an inch further from the weld are quite cool when they come from the machine. There is therefore no unnecessary waste of heat. This arises partly from the excellence of the arrangements for clamping the pieces in massive copper clamps, but it is mainly due to the great rapidity of action inherent in the process. The introduction of the electric transformer enables enormous currents to be so applied to the weld as to spend their energy just at the point where heating is required. They need, therefore only to be applied for a few seconds, and the operation is completed before the heat generated at the weld has had time to escape by conduction to any other part. The time required, for example, to weld round iron bars of 1⅛-inch diameter was on the average less than 33 seconds; though it could be accelerated to 25 seconds, or lengthened so as to last 45 seconds. Round bars of steel of ¾-inch diameter only required 16 seconds for welding, and were quite cool at a distance of 1¾-inch on either side of the weld.

"Such rapidity is the consequence of the arrangements which permit an enormous electric current to be suddenly generated exactly at the time and place where the local heating is required.

"Although the quantity of the current so employed in the pieces to be welded is enormous, the potential at which it is applied is extremely low, not much exceeding that of the batteries of cells used for ringing electric bells in houses, and quite incapable of giving any shock to the operator. While a weld was being made I have grasped the copper clamps of the welding machine with my two hands (having moistened them previously to render the skin more susceptible), but was unable to perceive the smallest shock or other sensation. The primary circuit of the machine is at a higher potential; high enough, if not protected, to give a sensible but not a dangerous shock. This portion of the machine is, however, not accessible from the side where the operator works, and is securely guarded. I have myself, while standing on the floor, touched all the accessible parts of the machine back and front while it was in action, and have been unable to detect more than the faintest tingling. *I consider, therefore, that the machine may be used with entire freedom from risk to life or limb.* * * *

"I procured from Messrs. Pfeil & Co., of Clerkenwell and Sheffield, some samples of cast steel of a quality which is largely employed for tool steel. This material is generally regarded as unweldable, and the samples procured by me were found to bear the maker's usual label, stating that "*this steel is not weldable.*" These samples I sent to Hoxton, where the engineer in charge of the welding (Mr. Fish) *found no difficulty in welding them;* the welds proving, when cold, to be good welds, quite satisfactory for the purpose of steel tools.

"Some other tests I have made of an electrical nature upon samples of welds produced by the Thomson process. I have measured the electric conductivity of various welded bars with the view of ascertaining whether the conductivity of the welded joint was inferior to that of the rest of the bar. In very few cases was the conductivity of the joint at all lower than that of the rest of the bar; in most cases it was the same, and in two cases (steel) actually higher. *Such tests, in my judgment, go far to show that a very perfect homogeneity of structure is secured by this method of welding.* This is what one would expect from a method of welding in which the union of the parts commences at the interior, and works outward until the weld is complete, and in which the surfaces which are to be united are not exposed heated to the air, but are only heated in the act of forcing them into contact with one another."

EXTRACT FROM

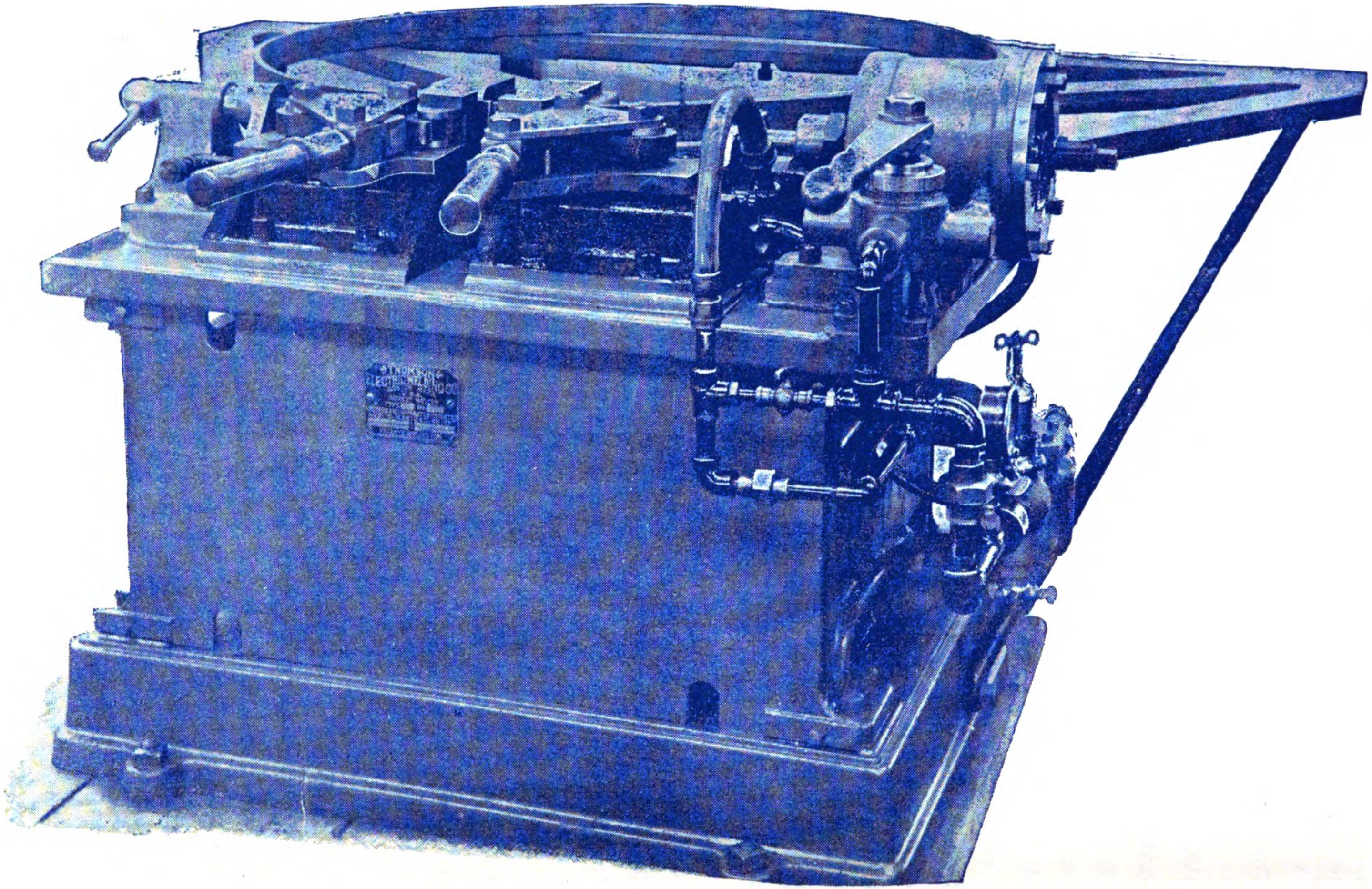
REPORT OF ALEXANDER B. W. KENNEDY, F.R.S.,

Vice-President Institute Mechanical Engineers; Member Institute Civil Engineers; Emeritus Professor of Engineering in University College, London.

DATED FEBRUARY 1, 1890.

"In accordance with your instructions I have visited the United States in order to see what progress has been made there in the direction of the practical carrying out of the Thomson Electric Welding Process. I have visited the offices of the Thomson Electric Welding Company at Boston, and have also spent about a week at their works at Lynn, Massachusetts, at both of which places I have had every facility given me for making all possible inquiries, experiments, and investigations. I have also visited five different works in the Eastern States (at Hartford, Ansonia, Brooklyn, and Trenton), where Thomson Electric Welders of various types have been in use for some time (in some cases over a year), commercially, and have made detailed inquiries at these places as to their working. * * *

"The welding of iron and steel wire was one of the first matters successfully carried out by the Company. I saw at the works of Messrs. John A. Roebling Son's Co., at Trenton, a welder which had been at work there for about thirteen months, for a great part of the time twenty hours per day, and *the counter of which showed that* 193,890 *welds had been made with it.* I also examined another wire welding machine at the Trenton Iron Works (Messrs. Cooper, Hewitt & Co.), which had done about nine months' work, and had made 22,095 welds, and at the same works a portable machine, recently installed, which had made 9,022 welds. This last machine was so arranged that it could be carried about easily by two men, and connected with the mains at any part of the immense shop in which it was placed, so as to be used for mending or other welding wherever required, without the necessity of bringing a heavy coil of wire to it. The managing partners of both the works spoke in the highest terms of the efficiency of the machines and as to the great saving caused by their perfect utilization of short lengths and broken wires. They also consider it an immense advantage that they were now able to deliver in longer lengths to the telegraph companies, so that the only joints in a telegraph line need be those made by the linesmen in erection. The substitution of a welded joint for any of the ordinary twisted ones, which they had previously used, had been found *to be of great advantage from the point*



WELDER FOR WAGON AND CARRIAGE TIRES.

of view of electrical conductivity; and I was informed that the Western Union Telegraph Company had now made it a condition in their specifications that all wire delivered to them should be electrically welded.

"The fact that the wire was galvanized caused no difficulty in connection with the welding.

"The welding of brass and copper wire, especially the latter, naturally presented much greater difficulties than that of iron wire, but those seem now to have been overcome. I saw at the works of Messrs. Wallace & Sons, in Ansonia, a welder for this purpose, which was one of the first machines put down, and had made 30,415 welds (by register) during the last 13 months* in copper and brass wire, the latter, in certain cases, of the very hard and poor quality used for making pins. I found the machine placed between the wire-drawing room and a winding room. It was at the time being used for welding coils of brass wire into continuous mile lengths (twelve coils to the mile length); the wire was about ⅛-inch diameter and of a very good quality of brass. Beside the welder stood a little machine for straightening the ends of the coils before putting them into the welder, and also a small machine for removing the burr after the weld had been made. The whole time taken in welding together the twelve coils, including all the handling of the coils, the straightening and the burr removal, was about twenty-five minutes.

"Stout copper wire was at the time being reeled in an adjacent shed, and every now and then this would break in the winding. The winders simply hauled the two broken ends along to the welder, and the other work there was stopped for a couple of minutes while the broken copper coil was mended. After this mending, the copper wire was as perfect, both in strength and conductivity, as before. Thus absolutely no wasters were made through breakages.

"I had five short pieces of the brass wire welded together into a length of about eighteen inches and the burrs removed (the whole operation only taking four or five minutes), and then took the welded pieces to the wire drawer and had it passed six times through the dies, reducing its diameter from 0.12 inches to 0.031 inches. *The existence of the four welds made no difference whatever in the drawing* (which was concontinued until the diameter was reduced to about 0.002 inches), and I was assured by Mr. Wallace that this was the case just as much with inferior qualities of brass.

"At present, machines are being made especially for a copper wire, in which the pressure is put on and the current thrown off automatically; thus making copper wire even easier to handle than iron wire. I worked one of these machines myself at Lynn, and its action seemed to me perfect. * * *

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* During about four months of this time the firm was not buying copper, and the machine was standing idle—at other times it has been frequently worked 14 hours per day.

"The Thomson Welders have been used for brazing as well as welding. I found at the immense bicycle works of the Weed Sewing Machine Company, in Hartford, Conn., a brazing welder which had been at work about nine months, and which had made, by register, 29,800 separate operations. When I saw the machine it was brazing the two limbs (tubes) of bicycle driving-wheel forks into the cast steel socket which joined them. The clamps were arranged so that the joint to be brazed stood vertically in the machine, and the brazing was applied in the form of fine wire previously twisted round the limb just above the socket. In this way it ran readily downwards, and, as I found on cutting a joint open, an excellent braze was made. I found that it took 10.5 minutes to make seven pairs of joints (previously wired), while a smith used to the work took 3½ minutes to one pair in the ordinary gas furnace. *The electrically brazed fork was also much cleaner than the other*, the borax and the heating had not spread nearly so much, and the work of finishing off would therefore be much less. * * *

"In summing up the whole matter I have to say that the Thomson Electric Welding Process has already, in America, been carried fairly beyond the experimental stage, *and has achieved sufficient success in regular commercial work of somewhat varied kinds to warrant the belief that its industrial future is one of the greatest practical importance* I can hardly suppose that any difficulties lie before it, in its future adaptations and applications, so great as those which have already been overcome, not only in the laboratory, but now also in the severer tests of some months of regular practical work.

THE FOLLOWING ARE LETTERS FROM MANUFACTURERS WHO ARE USING OUR ELECTRIC WELDING MACHINES.

WALLACE & SONS.

ANSONIA, CONN., June 10th, 1889.

THOMSON ELECTRIC WELDING CO.

Gentlemen:—In reply to yours of June 8th, we beg to say that the welding machine that we have in operation performs its work in an eminently satisfactory manner. We are able to accomplish so much more than by the old methods, that we should consider it a serious loss were we obliged to dispense with it. Yours truly,

WALLACE & SONS.

JOHN A. ROEBLING'S SONS CO.

TRENTON, N.J., June 10th, 1889.

THOMSON ELECTRIC WELDING CO., Boston, Mass.

Gentlemen: — We have now had your electric welder in operation at our works for a number of months, and have made about 80,000 welds on it, and we have no record of a single failure, and we are free to say that for such work as we are doing we consider the machine an absolute success. With the exception of a few hours' delay when first started, through an armature which was destroyed by accident, your machine has run constantly. So far as the practical workings of the machine are concerned, we do not think that anything more can be desired. Yours truly,

F. W. ROEBLING.

WEED SEWING MACHINE CO.

HARTFORD, CONN., June 11th, 1889.

THOMSON ELECTRIC WELDING CO.

Gentlemen: — The electric welding machine which you have delivered to us about April 15th, has been in almost constant use since that time. We have until recently used it for brazing with good success, realizing even better results than we anticipated. The machine is now at work daily on welding spring steel wire, giving us satisfactory results at a great saving of time and expense over our former process of doing the work. The machine has not yet failed us in any experiments that we have tried.

Respectfully yours, WEED SEWING MACHINE CO.

GEO. H. DAY, *Pres.*

SIMPLEX ELECTRICAL CO.

BOSTON, MASS., June 12, 1889.

THOMSON ELECTRIC WELDING CO.

Gentlemen: — The welding machine which you put into our factory last April is working to our perfect satisfaction. As you are aware, the principle welding we have to do is of copper wires. It is sufficient to say that the machine makes a perfect joint. Your expert sent to install the machine instructed one of our employees, and at the end of two days the man was perfectly instructed and competent to take exclusive care of the machine. We place a very high value upon this process.

Very respectfully yours, SIMPLEX ELECTRICAL CO.

A. F. MASON, *General Manager.*

M. SEWARD & SON.

New Haven, Conn., June 17th, 1889.

Thomson Electric Welding Co., Boston, Mass.

Gentlemen: — In reply to yours of the 14th inst., would say regarding the electric welding machine which you placed in our factory several months ago, that while we have not applied it to all kinds of work that we intend to, it is working admirably on such as we have used it for. We can see no reason why it is not all you claim for it. We think that with ordinary care it will do its work for years, with very little expense for repairs.

Very truly yours, M. SEWARD & SON.

THE NORTH HUDSON COUNTY RAILWAY CO.

Hoboken, N.J., Feb. 4, 1890.

Thomson Electric Welding Co.

Gentlemen: — * * * I take pleasure in stating to you that we have subjected the piece of 1⅜ in. steel cable, made by Cooper, Hewitt & Co. after the so called lock-wire pattern, welded by you to the following tests: We doubled the piece of cable backward and forward 130 times upon itself; then we put the weld between two pieces of iron on an anvil and gave it ten or twelve smart blows with a 12-lb. hammer; after that we bent it again ten times both ways. The weld did not start, and did not show any change.

Respectfully yours, J. H. BONN, *President.*

THE TRENTON IRON CO.

Trenton, N.J., June 6th, 1890.

Messrs. Thomson Electric Welding Co., Boston, Mass.

Gentlemen: — In reply to your inquiry of the 4th inst., asking for information about the working of the welding machines we have from you, all we can say is that they are giving us entire satisfaction. So far since they have been started, now over a year ago, they have run without any interruption whatever when they were required. The cost of maintenance and repairs has been merely nominal, and they show no signs of wear. The small indirect welder which you made specially for us has proved a very useful and handy machine. We carry it about all over our shop, and it does an infinite variety of work, welding soft iron wire, galvanized iron wire, soft steel wire, hard steel wire, and cast steel indiscriminately and with very uniform success. So far, on the direct welder we have made over 35,500 welds, and 23,000 welds on the portable machine. Altogether we cannot see how any wire works can now afford to do without one or more of these machines. * * * Yours truly,

THE TRENTON IRON CO.

E. Gybbon Spilsbury, *Gen'l Manager.*

NEW YORK FIFTH-WHEEL CO.

NEW YORK, June 7, 1890.

THOMSON ELECTRIC WELDING CO., 89 State St., Boston Mass.

Gentlemen:—In response to your inquiry of the 4th inst., would say that the welding machine still continues to give the best of satisfaction. Nevertheless, to be candid with you, when you put in the machine last September, we did not think it would do what you claimed for it, on account of the peculiar shape and the varying thickness of the material we use, but we find that we were mistaken, and that your claims are substantiated.

We would like to see your Mr. Royce sometime this month in regard to another welder for lighter work, as we think it will be economical to adopt this system in all our departments.

Yours respectfully, NEW YORK FIFTH-WHEEL CO.

Per FRANK J. SMITH, *Sec'y & Treas.*

PARRY MANUFACTURING CO.

INDIANAPOLIS, IND., June 10th, 1890.

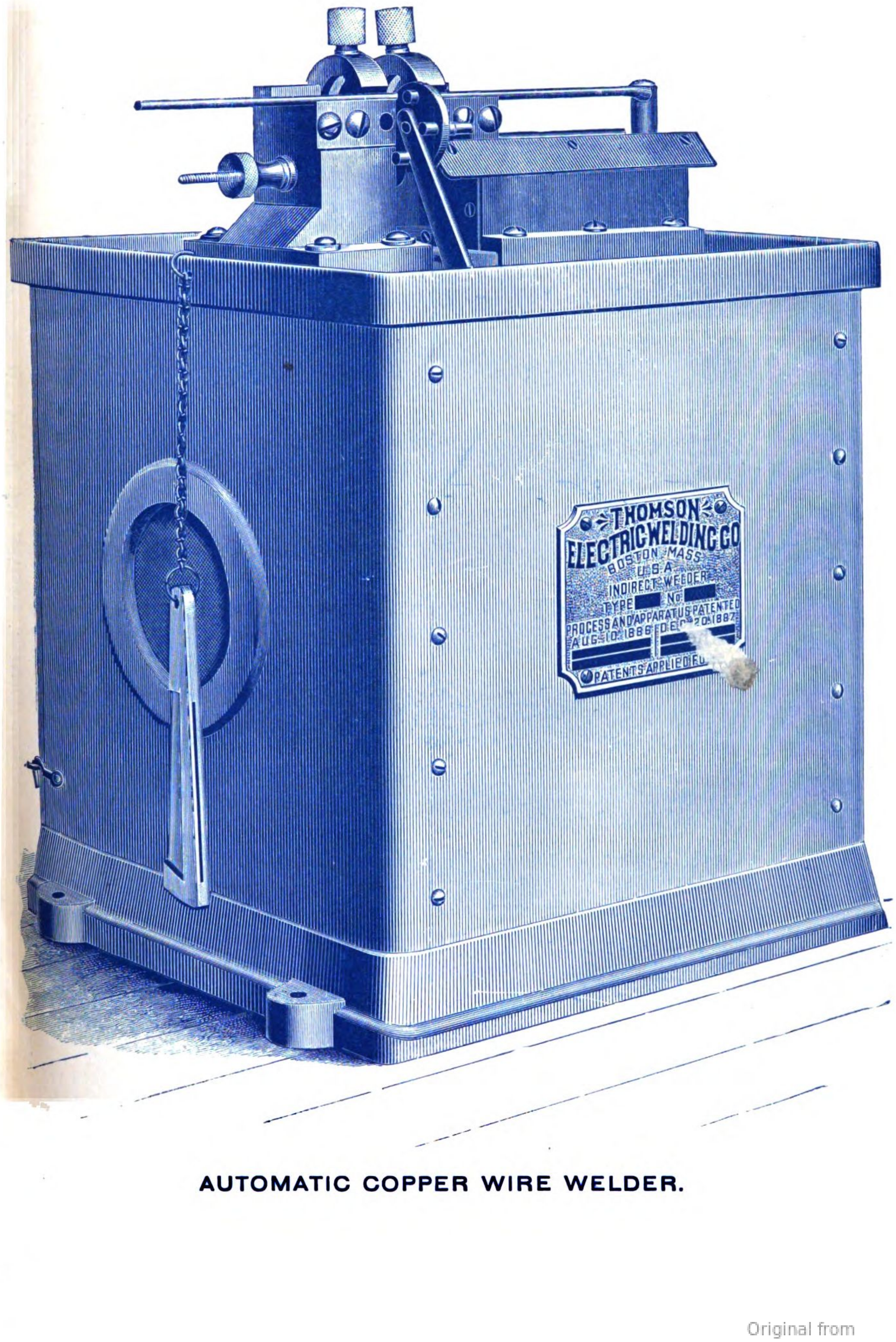
THOMSON ELECTRIC WELDING CO., Boston, Mass.

Gentlemen:—We are in receipt of your favor of the 2d inst. Respecting our electric welding plant, would say that same has been in daily operation now some seven months, and has proved satisfactory in the highest sense of the word, both as to economy, speed, and perfectness. I am at a loss to give you any comparison, as it is a very hard matter to compare our present welding plant with our old fire method of making welds. The difference is so great that I cannot give you any comparison. We have not had any experience with any repairs or loss of time from any cause, and cannot see but that our plant is in as perfect shape to-day as it was the first day we run it, and have no hesitancy in expressing our belief that the simpleness of the mechanical construction of both the dynamo and welding machines will cause very little or no trouble to keep them in complete running condition for quite a number of years. I am convinced that we could justify ourselves by putting in a complete plant for each year's use, if it were necessary to do so, as the outlay in money for a new plant each year would be *more* than met by the saving in trouble, time, and expense over the old method.

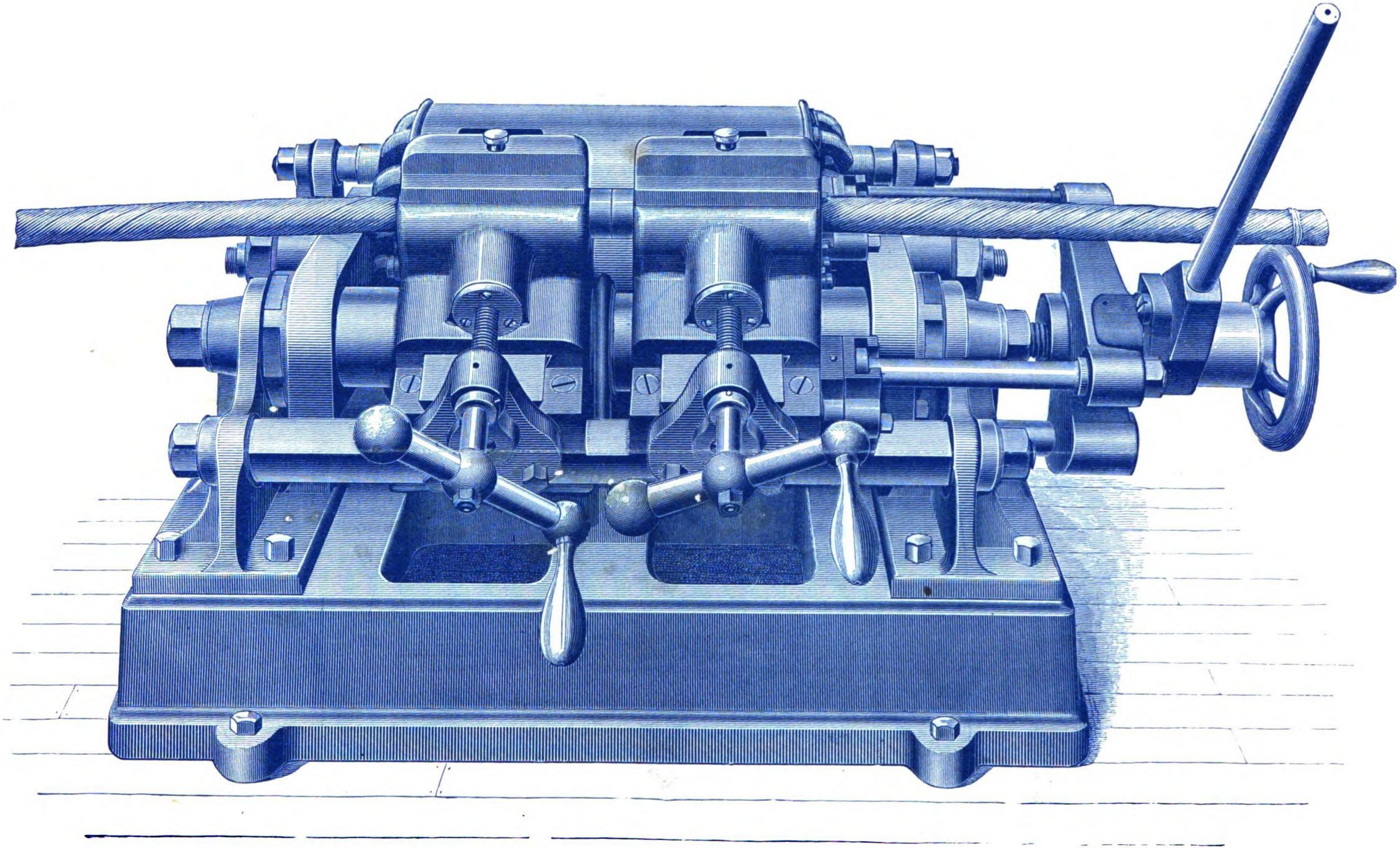
Very respectfully yours,

PARRY MANUFACTURING CO.

By D. M. PARRY, *President.*



AUTOMATIC COPPER WIRE WELDER.



WELDER FOR STEEL WIRE CABLE, RODS OR BARS OF IRON OR STEEL.

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